



Certificate Number MASC MS/13-188X
Issued: 13 March 2020
Expired: 14 February 2023
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IA – CERTIFICATE (Supplement 3 as per ARP 0108)

IN TERMS OF REGULATION 21.17.2 OF THE MINERALS ACT (INCORPORATION THE MINE HEALTH AND SAFETY ACT) AND REGULATION 9 (1) OF THE ELECTRICAL MACHINERY REGULATIONS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT

| | |
|-----------------------|---|
| Ex – Type Examination | |
| Certificate number: | MASC MS/13-188X |
| Equipment: | TX592x Vortex Gas Flow Sensor / Transmitter |
| Serial No: | (See “Conditions of Certification”) |
| Applicant: | Trolex Limited |
| Address: | Newly Road Hazel Grove Stockport SK7 5D United Kingdom |
| Manufacturer: | Trolex Limited |
| Address: | Newly Road Hazel Grove Stockport SK7 5D United Kingdom |

DESCRIPTION OF EQUIPMENT

The TX592x-Series Vortex Gas Flow Sensor / Transmitters comprise three PCBs housed in an anti-static plastic enclosure. A polycarbonate window is fitted to allow viewing of the liquid crystal display. The Vortex Gas Flow Sensor, which projects from the enclosure or is mounted remotely via a flying lead, comprises a single PCB in a stainless steel cylindrical case.

There are three types of Sensor / Transmitters:

- TX5921: rear-projecting sensor
- TX5922: side-projecting sensor
- TX5923: remote sensor

Each of these types may be manufactured in one of four versions:

- Group I: 4 to 20 mA version
- Group I: 0.4 to 2 V version
- Group I: 5 to 15 Hz version
- Group II: 4 to 20mA version

The supply to the equipment is via terminals T3 and T4. The equipment is designed to detect the rate of gas flow by creating a stream of vortices, through which an ultrasonic beam is passed. The received signal, which is modulated by the vortex stream, is then converted into an output at terminals T1 and T2.

/. The TX5921...

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The TX5921/2/3 have the following safety descriptions:

| Version: | T3/T4 (supply) | T1/T2 (signal out) [See notes 1 – 3] |
|-------------------------------|--|--|
| Group I: 4 - 20mA version: | U _i = 16.5V; C _i = 4 nF; Li = 0 | U _i = 16.5V P _i = 1.72W C _i = 15nF; Li = 0. U _o = 16.5V; I _o = 220mA P _o = 0.91W C _o = 11.9µF; L _o = 2.6mH. |
| Group I: 0.4 – 2V version | U _i = 16.5V; C _i = 4 nF; Li = 0 | U _i = 16.5V P _i = 1.72W C _i = 15nF; Li = 0. U _o = 16.5V; I _o = 41mA P _o = 0.17W C _o = 11.9µF; L _o = 2.6mH. |
| Group I: 5 – 15Hz version | U _i = 16.5V; C _i = 4 nF; Li = 0 | U _i = 16.5V P _i = 1.72W C _i = 0; Li = 0. U _o = 0 |

| Version: | T1/T2/T3/T4 (total input to 'supply' and 'signal out') |
|--------------------------------|---|
| Group II: 4 – 20mA version: | U _i = 28V; I _i = 120mA P _i = 0.84W C _i = 18.3nF; Li = 0 |

Note 1: In some applications, T1 and T2 are inputs, in which case these output parameters are not relevant.

Note 2: For Group I builds, the connections to terminals T1/T2 and T3/T4 shall be from the same power supply. The user should note that the power to terminals T1/T2 must be limited to 1.72W via a supply with a minimum source resistance of 40 Ω. There is no specific limitation to terminals T3/T4, so terminals T1/T2 and T3/T4 should be regarded as separate intrinsically safe circuits.

Note 3: The user should refer to the parameters of the equipment connected to terminals T1/T2 and compare these to the parameters listed in the table. The more onerous set of parameters should be used.

Note 4: Terminals T5, T6 and T8 are connections to the Vortex Head which may be integral with the main part of the apparatus (TX5921 and TX5922) or connected by a cable not exceeding 10m in length (TX5923). T7 is not connected.

The equipment has not been assessed as a 'safety device' as referenced in Directive 94/9/EC, Annex II, clause 1.5.

TX-592x-Series Vortex Sensing Head

The TX592x Vortex Gas Flow Sensor Remote Head is a stand-alone item of apparatus designed to be powered from a suitable barrier or isolator, or alternatively via a sensor/transmitter. The Vortex Head comprises a single PCB in a stainless steel cylindrical case. The apparatus is designed to detect the rate of gas flow by creating a stream of vortices, through which an ultrasonic beam is passed. The received signal is modulated by the vortex stream.

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There are two types of Sensing Heads:

1. TX5924: hand-held
2. TX5925: fixed-mount

Both of these types are manufactured for Group I and Group II applications. The construction of the Group I and Group II versions is identical. The Vortex Head has the following safety description:

| Group I (total of supply plus signal) | Group II (total of supply plus signal) |
|---------------------------------------|--|
| U _i = 16.5V | U _i = 30V |
| I _i = 390mA | I _i = 390mA |
| P _i = 1.61W | P _i = 1.2W |
| C _i = 0 | C _i = 0 |
| L _i = 15μH | L _i = 15μH |

The equipment has not been assessed as a 'safety device' as referenced in Directive 94/9/EC, Annex II, clause 1.5.

Variation 1 - This variation introduced the following changes:

- i. The use of pad printing was recognised as an alternative method of marking.

Variation 2 - This variation introduced the following changes:

- i. A potentiometer was added to the sensor head circuit.

Variation 3 - This variation introduced the following changes:

- i. The value of C26 was increased from 2.64nF to 12nF.

Variation 4 - This variation introduced the following changes:

- i. The use 'Faradex' stainless steel filled nylon 6 as an alternative anti-static enclosure material.

Variation 5 - This variation introduced the following changes:

- i. To permit the value of C26 in the 4-20mA Group I build to be increased from 2.64nF to 12nF.

Variation 6 - This variation introduced the following changes:

- i. The mechanical design of the head was varied as required.

Variation 7 - This variation introduced the following changes:

- i. To recognise that the equipment complies with IEC 60079-0:2011, IEC 60079-11:2012, IEC 60079-26:2007 & EN 50303:2000. The list of standards is updated accordingly.
- ii. The addition of an alternative plastic enclosure material with anti-static properties.
- iii. The deletion of the zinc alloy enclosure option.
- iv. The marking details are now laser-etched on a stainless steel label and is attached to the front face of the apparatus.

/ . v. The use...

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- v. The use of Bedford opto-isolator Type OPI1264D approved under BAS 01ATEX1278U/4 coded Ex ia IIC Ga as a replacement to that approved under BAS Ex 89C2096U/2 coded EEx ia IIC.
- vi. The use of Littelfuse 259 approved under Baseefa02ATEX0071U – Issue 3 coded Ex as a replacement to that approved under BAS Ex832302U.
- vii. As a result of the modifications the Product Description, Conditions of Certification, Special Conditions For Safe Use and Marking were amended.

MARKING (According to the Sira Certificate):

Trox Limited

TX592x Vortex Gas Flow Sensor / Transmitter

| | |
|--|---------------------|
|  I M1 | II 1G |
| Ex ia I Ma | Ex ia IIC Ga T4 |
| Ta = -20°C to +60°C | Ta = -20°C to +60°C |

Additional MASC Marking

Ex Rating: Ex ia I / IIC T4 (Ta = -20°C to +60°C)

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COMPLIANCE:

The unit as described above and in MASC Letter **13-188-R3** is hereby certified “Explosion Protected” Ex ia I / IIC T4 (Ta = -20°C to +60°C) and is suitable for use in hazardous locations as stated below and as tested, assessed and inspected in accordance with the relevant requirements of SANS Standards:

SANS / IEC 60079: “Electrical apparatus for explosive gas atmospheres”,

- **SANS/(IEC) 60079-0 : 2012 “General Requirements”;**
- **SANS/(IEC) 60079-11: 2012 “Intrinsic Safety ‘i’”;**
- **SANS/(IEC) 60079-26: 2007 “Equipment protective level (EPL) ‘Ga’”**
- **ARP 0108 (Edition 1.1) “Regulatory requirements for explosion protected apparatus”.**

| | | |
|----------------------|----------------|---|
| Location | Zone 0 & 1 | Coal dust / Gas: Underground and Surface |
| Hazard Frequency | --- | Continuous as could occur under normal operating conditions in hazardous area |
| Environment | Group I/IIC | Methane Coal dust / Propane to Hydrogen |
| Limiting Temperature | T4 | 135°C |
| Ambient Temperature | -20°C to +60°C | |

The use of apparatus in hazardous locations is subject to the following provisions as applicable, which shall be adhered to:

- i) SANS 10086 requirements;
- ii) Any conditions mentioned in the above report;
- iii) Codes of Practice enforced in terms of Regulations 21.17.2 of Minerals Act, by Chief Inspector of Mines;
- iv) Any restrictions and conditions enforced by Chief Inspectors of Mines, Principal Inspector (Group I equipment) of Chief Inspector of Factories (Group II equipment);
- v) Any relevant requirements of the MHS Act or the OHS Act.

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SPECIAL CONDITIONS OF USE ("X") (According to the Sira Certificate):

1. The only sensor that may be used with the TX5923 (remote sensor head version) is that supplied by Trolex. The maximum length of cable allowed is 10 m.
2. The plastic enclosure and the polycarbonate window are non-conducting and may generate an ignition capable level of static under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of static on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

CONDITIONS OF CERTIFICATION:

1. This Certificate remains valid based on the validity of the QAR/QAN and no more than 3 years.
2. The apparatus must be additionally marked with the MASC marking details above.
3. This approval only covers the equipment as certified above and does not include any scheduled additions or variations/amendments/new issues to the certificate(s), made after the above date.
4. The equipment does not need to be re-tested when used on the conditions and with such restrictions as prescribed by Sira and in this approval.
5. The Sira certification must remain valid.
6. The extent of the requirements in the ARP 0108 (or regulations) and SANS 10108 on the certification of the equipment must remain unchanged.
7. The Ex quality assurance notification for the equipment must remain valid.

Approved on behalf of MASC



DP Visser
TECHNICAL SPECIALIST



M Dekker
TECHNICAL OFFICER

Mining And Surface Certification

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MASC takes no responsibility for any non-conformances, exclusions or any results / assessments not in compliance with the standards. By marking the equipment in accordance with the documentation / standard, the manufacturer attests on his own responsibility that the equipment has been constructed in accordance with the applicable requirements of the relevant standards and that the routine verifications and routine tests have been successfully completed and the product complies with the documentation and standard(s).

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